

[CLAIMS]

What is claimed is:

X 1. A method for protecting an animal subject against lethal infection with *B. anthracis*, comprising:

5 administering an immunogenic composition which comprises purified or recombinant *B. anthracis* lethal factor (LF) protein or an immunogenic fragment thereof to the subject.

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10 2. The method of claim 1 wherein the immunogenic composition comprises a mutated LF protein or an immunogenic fragment of an LF protein, and

15 further comprising administering an immunogenic composition which comprises purified or recombinant *B. anthracis* protective antigen (PA) protein or an immunogenic fragment thereof to the subject.

20 3. The method of claim 1 wherein the LF protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 775 of the sequence set forth in SEQ ID NO:2.

25 4. The method of claim 1 wherein the LF protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 9 through amino acid 252 of the sequence set forth in SEQ ID NO. 2.

5. The method of claim 2 wherein the PA protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

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6. The method of claim 2 wherein the PA protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 175 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

30 7. A method for protecting a susceptible animal subject against lethal infection with *B. anthracis*, comprising:

administering a nucleic acid-based immunogenic composition which comprises an isolated polynucleotide which encodes a mutated *B. anthracis* lethal factor (LF) protein or an immunogenic fragment thereof to the subject, said polynucleotide being operably linked to a promoter which drives expression of the mutated LF protein or the immunogenic LF protein fragment.

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8. The method of claim 7 further comprising administering an immunogenic composition which comprises an isolated polynucleotide which encodes *B. anthracis* protective antigen (PA) protein or an immunogenic fragment thereof to the subject, said polynucleotide being operably linked to a promoter which drives expression of the PA protein or immunogenic fragment thereof in the subject.

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9. The method of claim 7 wherein the LF protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 775 of the sequence set forth in SEQ ID NO:2.

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10. The method of claim 7 wherein the LF protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 9 through amino acid 252 of the sequence set forth in SEQ ID NO. 2.

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11. The method of claim 8 wherein the PA protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

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12. The method of claim 8 wherein the PA protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 175 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

13. The method of claim 7 wherein the polynucleotide is a component of a nucleic acid-based vaccine

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14. The method of claim 7 wherein the polynucleotide is a component of a viral vaccine.

15. The method of claim 8 wherein administration of the LF polynucleotide and the PA polynucleotide enhance production of antibodies to LF and PA protein in the subject.

16. The method of claim 8 further comprising administering a peptide-based immunogenic composition to the subject, said second immunogenic composition comprising an immunogen selected from the group consisting of a mutated LF protein, an immunogenic fragment of an LF protein, a PA protein, an immunogenic fragment of a PA protein, and combinations thereof, wherein said second immunogenic composition is administered to the subject before or after administration of the polynucleotide-based immunogenic composition

17. An immunogenic composition for preparing a vaccine which protects a subject against lethal infection *B. anthracis*, said immunogenic composition comprising a purified or recombinant lethal factor (LF) protein or immunogenic fragment thereof and a pharmaceutically acceptable carrier or diluent.

18. The immunogenic composition of claim 17 wherein said immunogenic composition comprises a mutated LF protein or an immunogenic fragment of an LF protein and a purified or recombinant *B. anthracis* PA protein or immunogenic fragment thereof

19. The immunogenic composition of claim 18 wherein the mutated LF protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 735 of the sequence set forth in SEQ ID NO:2.

20. The immunogenic composition of claim 18 wherein the LF protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 9 through amino acid 252 of the sequence set forth in SEQ ID NO. 2.

22. The immunogenic composition of claim 18 wherein the PA protein comprises a sequence which is at least 90% identical to a sequence extending from amino acid 1 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

22. The immunogenic composition of claim 18 wherein the PA protein fragment comprises a sequence which is at least 90% identical to a sequence extending from amino acid 175 through amino acid 735 of the sequence set forth in SEQ ID NO. 4.

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23. A nucleic-acid based immunogenic composition for preparing a vaccine which protects a subject against lethal infection *B. anthracis*, said immunogenic composition comprising a polynucleotide which encodes a mutated lethal factor (LF) protein or immunogenic fragment of LF protein and a pharmaceutically acceptable carrier or diluent.

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24. The immunogenic composition of claim 23 further comprising an isolated polynucleotide which encodes *B. anthracis* protective antigen(PA) protein or an immunogenic fragment thereof to the subject, said polynucleotide being operably linked to a promoter which drives expression of the PA protein ,

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25. The immunogenic composition of claim 24 wherein the PA polynucleotide comprises a sequence comprising consecutively nucleotide 610 through nucleotide 2295 of the sequence set forth in SEQ ID NO. 3.

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26. The immunogenic composition of claim 24 wherein the LF polynucleotide and the PA polynucleotide are on separate DNA constructs.

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27. The immunogenic composition of claim 24 wherein the LF polynucleotide and the PA polynucleotide are on the same DNA construct.

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28. A method for inducing an immune response which inactivates the *B. anthracis* toxin in an animal, said method comprising administering to the animal an immunogenic composition which comprises an isolated nucleic acid which encodes a mutated *B. anthracis* lethal factor (LF) protein or an immunogenic fragment of LF protein to the subject, said nucleic acid being operably linked to a promoter which drives expression of the mutated LF protein or the immunogenic LF protein fragment.

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29. The method of claim 26 further comprising administering an immunogenic composition which comprises an isolated nucleic acid which encodes *B. anthracis* protective antigen(PA) protein or an immunogenic fragment thereof to the subject, said nucleic acid being operably linked to a promoter which drives expression of the PA protein or immunogenic fragment thereof in the subject.

30. The method of claim 28 wherein the method protects the subject from challenge with a dose which is at least 3 times the LD₅₀ of the lethal toxin.

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